

expected a mere piece of five segments to be preserved as this was, even though endowed with the power of recovery, yet we cannot regard so extended and remarkable a function as this appears to be as useless or inoperative in the natural course of Naid-life.

XXXVII.—*On the Geographical Distribution and Varieties of the Honey-Bee, with Remarks upon the Exotic Honey-Bees of the Old World.* By Dr. A. GERSTÄCKER.

[Concluded from p. 283.]

AFTER some remarks on the singular fact that, in Africa, which generally exhibits such a remarkable uniformity in its insect-fauna, the geographical distribution and varieties of the Honey-Bee are more complicated than elsewhere, the author proceeds to the consideration of the diffusion of the Bee in America.

The American form is identical with the dark-coloured North-European one. In some American countries, for example, Brazil, the Bee is known to have been introduced from Europe; but it has been questioned whether this applies equally to other regions, such as North America, where the Honey-Bee has existed much longer. With the exception of Olivier (*Enc. Méth. Ins.* i. p. 49), who doubted the identity of the American Bee with the European species, the best European entomologists have been in favour of the introduction of this insect from Europe into America. Dr. Gerstäcker quotes Latreille*, St. Fargeau†, Westwood‡, and Lacordaire§ in support of this statement. Latreille states, on the authority of Bosc, that in North America “the savages know that they are in proximity to the possessions of the Anglo-Americans by the presence of the societies of these insects.” Among the native American writers the author quotes Thomas Jefferson, who, in his ‘Notes on the State of Virginia’ (1787, p. 121), speaks as follows:—“The Honey-Bee is not a native of our continent. The Indians concur with us in the tradition that it was brought from Europe; but when, and by whom, we know not. The Bees have generally extended themselves into the country a little in advance of the white settlers. The Indians therefore call them ‘the white man’s fly,’ and consider their approach as indicating the approach of the settlements of the whites.”

Prince Maximilian of Wied (*Reise in Nord-Amerika*, i. p. 180 & ii. p. 346) speaks in similar terms of the introduction of the

* Humboldt, *Obs. Zool.* p. 299, and *Ann. Mus.* p. 167.

† *Hist. Nat. Ins. Hymén.* i. p. 401.

‡ *Introd.* ii. p. 285. § *Introd. à l’Entom.* p. 543.

Honey-Bee into the United States, and adds that "it is now diffused far up the Missouri, and its honey is cut out of the hollow trees by Indians and whites." John Josselyn (Voyage to New England, 1663, p. 120) says, "The Honey-Bees are carried over by the English, and thrive there (in New England) exceedingly;" and Benjamin Smith Barton, in a learned and impartial memoir entitled "An Inquiry into the Question whether the *Apis mellifica*, or true Honey-Bee, is a native of America" (Trans. Amer. Phil. Soc. iii. pp. 251-261, Philadelphia, 1793), expresses himself decidedly in favour of the introduction of the Bee from Europe, and supports his opinion by the most convincing proofs.

Authors have not been wanting, however, especially among the North Americans, who have endeavoured to give their country the credit of the original possession of so valuable an insect as the Bee. The arguments of Van der Heuvel, in his memoir "On American Honey-Bees" (Silliman's Journal, iii. pp. 79-85, 1821), already sufficiently refuted by Brun (Bienenzeitung, 1858, pp. 37-44), are evidently chiefly derived from a treatise by a Dr. Belknap, published in 1792, and entitled 'A Discourse intended to commemorate the discovery of America by Christopher Columbus.' An appendix to this latter memoir contains an argument against the European origin of the North American Honey-Bees, supported on the following facts:—1. Columbus, on his first return from the Antilles, when threatened with destruction in a storm, inclosed a report of his voyage in a capsule of wax which he obtained at Hispaniola. 2. According to Purchas, the Mexicans had to furnish a certain quantity of honey yearly as tribute to their kings, even before the arrival of the Spaniards. 3. Also according to Purchas, when Ferdinand de Soto, in the year 1540, came to Chiaha in Florida, he found amongst the stores of the Indians of that place a pot full of Bees' honey. At this time no Europeans were settled in America, except in Mexico and Peru; whence the author concludes that, before the arrival of Europeans, the Honey-Bee must have existed as far north as Florida. With regard to the first case, as indicated by Barton, the wax used by Columbus might have been obtained from plants, such as *Myrica cerifera*; but indigenous Honey-Bees of the genera *Trigona* and *Melipona* existed in the Antilles before their discovery by Europeans. Clavigero was acquainted with five Mexican species of Honey-Bees, and we now know at least sixteen; so that the Mexicans could have had no want of honey even before the arrival of Cortez. Thus both the first evidences adduced by Belknap come to nothing. An apparently stronger proof of the early existence of the true Honey-Bee in Mexico, which has escaped both Belknap and

Barton, is to be found in the work of Hernandez on New Spain (Franc. Hernandez, *Rerum medicarum Novæ Hispaniæ The-saurus*, Romæ, 1648, lib. ix. p. 333. cap. 21). Hernandez says, "Multa mellis genera in Nova Hispania mihi adhuc observare licuit, non loco solum, veluti vetere orbe, verum ipsa materia et apum diversis generibus distantia. Primum est Hispaniensi per omnia simile idemque et quod ab apibus Hispanicis congeneribus sponte in cavitatibus arborum fabricetur, quas Indi sectas in apiaria reponunt ac congerunt." Such evidence as this, from an observer only seventy years later than the conquest of Mexico, would almost seem to be convincing; but it may be urged, on the one hand, that there had been time enough for the introduction of the European Bee into the colony and for its dispersion, and on the other, with more probability, that, as Hernandez had no pretensions to be a practised zoologist, he mistook one of the native species for the true Honey-Bee. This is rendered more probable by the existence in Mexico of a species of *Melipona* (still undescribed) intermediate between *M. rufiventris* and *bicolor*, Lepel., which so closely resembles the European Honey-Bee, at least in form and size, that an unpractised observer of the sixteenth century might easily have confounded them.

With regard to Belknap's third proof, Barton thinks that, on account of the occurrence of indigenous Bees (*Melipona*, *Trigona*), the pot of honey found by Ferdinand de Soto in Florida has no more value as evidence than the Mexican tribute. But this notion is without foundation, as we have no evidence of the existence of such Bees in Florida. It is, however, not improbable; for as only *one* species of *Melipona* (the *Apis atrata*, Fab.) is known from North America, whilst the northern extension of the *Meliponæ* and *Trigonæ* otherwise terminates with the Antilles and Mexico, we may assume with great probability that this single species, which extends beyond the proper district of its group, will exist in the southernmost portion of North America. But however this may be, Purchas's statement can by no means lead to the assumption that the European Bee existed in Florida in the time of Ferdinand de Soto, as is shown by another report, by a Portuguese nobleman who accompanied that general (A Relation of the Invasion and Conquest of Florida by the Spaniards under Fernando de Soto). In this it is stated that "The Indians of Chiaha had a great quantity of butter or, rather, fat, in pots, as fluid as oil; they said it was bear's fat. We also found there walnut-oil, as clear as the fat, and a pot of honey, although neither before nor afterwards did we find either bees or honey in the whole of Florida." Barton also quotes a statement of William Bartram's which directly proves the introduction of the Honey-Bee into Florida. He says, "When Bartram was in

West Florida, in the year 1775, a beehive, the only one in the country far or near, was shown to him as a curiosity; it had been brought there from England when the English, in 1763, took possession of Pensacola. In East Florida the Honey-Bee is certainly now (in 1793) met with in a wild state, and it has been known there for a long time, perhaps a hundred years;” but Bartram’s investigations convinced him that it was not indigenous there. Although the date of the introduction of the Honey-Bee into North America cannot be fixed, two circumstances mentioned by Barton indicate clearly that it must have been introduced by the whites. One of these is the name of the “white man’s fly,” given to the insect by the Indians; the other the fact that when John Elliott was translating the Bible into the language of the Indians, no expression existed in the latter for either wax or honey.

However probable it may appear, from these considerations, that the Honey-Bee was introduced into North America from Europe, we still want the certain historical proof of the introduction, and of the time when it took place; nevertheless the following historical evidence renders the fact of the introduction from Europe not in the least doubtful:—

1. According to Barton (*loc. cit. suprâ*, p. 251), Penn, the founder of Pennsylvania, does not mention the Bee in a letter of details to his friends, in the year 1683; had it been a native of Pennsylvania, he would not have omitted so useful an insect from his catalogue of Pennsylvanian animals. The older Swedish writers upon Pennsylvania also do not mention the Bee.

2. Lawson (*Voyage to Carolina*, 1704) does not notice the Bee amongst the animals indigenous to Carolina. 3. Barton (*loc. cit.* p. 258) says, “The Honey-Bee did not exist in Kentucky when we first became acquainted with the country. But about 1780, a beehive was brought by a Colonel Herrod to the Falls of the Ohio, since when these insects have increased extraordinarily. Not long since a hunter found thirty wild swarms in one day.”

4. Barton further states that “Honey-Bees were not found in the Jenessie district of New York either at the time when it was first visited or for a considerable time afterwards. Recently (towards 1793) two beehives were introduced, and these will undoubtedly soon spread over the neighbourhood.”

5. D. B. Warden (*Statistical, Political, and Historical Account of the United States*, 1819, vol. iii. p. 139), quoting from Bradbury, says, “Before the year 1797 the Honey-Bee was not found to the west of the Mississippi; they are now seen as high up as the Maha nation on the Missouri, having proceeded westward 600 miles in fourteen years.”

6, 7. Humboldt, speaking of the wax produced in Cuba, says that it is produced chiefly by the European

Bee, which has been much cultivated since the year 1772*. The Bee was introduced from Florida. 8. According to Ramon de la Sagra (Historia de la isla de Cuba, 1831, p. 80) the introduction of the Honey-Bee into Cuba took place from Florida in 1764; and in that author's 'Natural History of Cuba' (ii. 7. p. 327) *Apis mellifica* is mentioned as introduced into Cuba. 9. Ulloa, as quoted by Olivier (Enc. méth. Insectes, i. p. 49), gives the date 1764 for the introduction of the Honey-Bee into Cuba, and describes the extraordinary rapidity with which the insects multiplied and spread themselves over the country. 10. Moreau de Saint-Méry (Desc. de la partie Française de l'île Saint-Domingue, tome ii. p. 112, 1798) gives the date 1781 for the introduction of the Honey-Bee into St. Domingo; he says it was brought from Martinique by the Comte de la Croix.

From these various reports we gather that, in the most different parts of North America, where the Honey-Bee now exists, it was wanting not very long since, and that in some of them (*e. g.* in New York and to the west of the Mississippi) it was only introduced about seventy or even sixty-five years ago. We first find the Bee in West Florida in the year 1763; in 1780, first in Kentucky; a little before 1793, first in New York; since 1797, westward of the Mississippi. (In English North America, according to Josselyn, it existed as early as the seventeenth century, having been introduced there from England.) Thus the diffusion of the Bee has taken place in North America in a north-westerly direction. The introduction into West Florida by the English took place in 1763; in 1764 the Bee was introduced from Florida into Cuba, but from San Augustino in East Florida, where, according to Bartram, the insect existed at the end of the seventeenth century, having probably been introduced by the Spaniards. This joint introduction by the English and Spaniards is borne out by the fact that amongst both these nations we find the dark form of the Honey-Bee, which also is the one occurring in America; whereas the Asiatic form, from which the American Bees would most probably have descended had their migration taken place naturally, is the most light-coloured.

The extraordinary manner in which the Honey-Bee has thriven in America since its introduction is shown most strikingly by the production of wax in Cuba, where the cultivation of Bees has been carried on very extensively since 1772. According to Humboldt (Essai polit. sur Cuba, i. p. 259), the average export of wax, between 1774 and 1779, was only 2700 arrobas (=81,000 pounds); in 1803 it amounted to 42,700 arrobas

* Essai polit. sur la Nouvelle Espagne, 1811, tome ii. p. 455; Essai polit. sur l'île de Cuba, 1826, tome i. p. 259.

(= 1,281,000 pounds). In Ramon de la Sagra's 'Historia Fisica, &c., de la isla de Cuba (i. pp. 283 & 299) we find as the average amount for the first thirty years of the present century, 69,476 arrobas (= 2,084,280 pounds) of wax, and 84,044 arrobas (= 2,521,320 pounds) of honey. The quantity has probably increased considerably in the last twenty years.

Of the diffusion of the Honey-Bee in America south of the Antilles and Mexico we know very little. It is found in Honduras, according to Squier (Notes on Central America, particularly the States of Honduras and San Salvador, 1855, p. 199), but does not appear to have extended itself southwards from that country, as it is not even mentioned as occurring in Costa Rica by Wagner and Scherzer (Die Republik Costa Rica im Central-Amerika, Leipzig, 1856), although we can hardly suppose that Wagner would have passed it without notice had he seen it there. According to oral communication from Prof. Karsten, the Bee does not occur in New Granada and Venezuela; nor has it been sent from those republics by Moritz. The introduction of the Bee into Brazil (Minas Geraës) took place from Portugal in 1845, according to Reinhardt (Brun, Bienenzeitung, 1858, p. 43); and its great diffusion there is indirectly testified by Burmeister (Reise nach Brasilien, p. 220). The absence of the Bee in the States of La Plata and Chili appears from there being no mention of it in the works of Burmeister and Claude Gay (Reise durch die La Plata Staaten, Halle, 1861; Historia fisica y politica de Chile, Zoologia, tom. iii.-vii.).

On the Australian continent the Honey-Bee does not yet appear to exist; and Australia appears to be peculiarly poor in honey-gathering insects, as we do not yet know even a *Bombus* from that country. Only a small species of *Trigona* has lately been described by Smith (Catal. Hymen. Brit. Mus. ii. p. 414).

With regard to the distinctions existing among the hive-bees of different localities, upon which Latreille and others have founded specific characters, the author remarks that these consist exclusively of differences of colour, and are so variable that no dependence can be placed upon them. The colour of the scutellum, upon which Latreille even based two groups of species, has so little constancy that in three specimens from the same locality as many gradations from light to dark may be detected. The identity of the Italian with the northern Bee is demonstrated by the perfect mutual fertility of the two forms; and the African form approaches much more closely to the Italian than the latter does to the northern Bee. The author describes the following forms of Bees as known to him, arranging them according to the localities in which they occur:—

1. NORTH GERMANY (Berlin, Neustadt-Eberswalde, Hartz, Erzgebirge).—Numerous specimens: queens, drones, and workers.
 - a. Unicolorous dark northern Bee. Seen on the crest of the Erzgebirge, sparingly, at a height of 2800 feet; in larger quantity on the summit of the Brocken, at 3500 feet, in August 1856.
 - b. One specimen of a worker, captured by Klug at the beginning of this century, near Berlin, has on the second abdominal segment a reddish-yellow basal band of one-third of its length.
 - c. Italian Bee of very recent times (imported).
 - d. Crosses of the northern and Italian Bees, of very recent date.
2. SOUTH OF FRANCE.—3 specimens of workers.
 - a. (2 sp.) Unicolorous northern Bee.
 - b. (1 sp.) of early date (beginning of this century); Italian Bee, with a reddish-brown scutellum.
3. ANDALUSIA (Staudinger, Waltl).—6 specimens of workers.
 - a. (5 sp.) Unicolorous northern Bee.
 - b. (1 sp.) More densely clothed with yellowish hair than the northern Bee; a very small reddish-yellow point on each side of the base of the second abdominal segment.
4. PORTUGAL (Hoffmannsegg).—3 workers, 1 drone.
 - a. (2 sp.) Unicolorous northern Bee.
 - b. (1 sp.) A narrow, transverse, yellow spot on each side of the base of the second abdominal segment; scutellum with a yellowish-red apex.
5. LIGURIA (Spinola).—5 specimens, drones and workers.
Italian Bee (types of the *Apis ligustica*, Spin.).
6. SICILY (Schultz).—1 worker.
Italian Bee with the scutellum almost entirely reddish-yellow.
7. VALTELINE (Italian Switzerland).—1 specimen*, of the year 1858. Italian Bee.
8. BOTZEN IN THE TYROL (Kahr).—2 specimens, 1861.
Somewhat smaller than the northern Bee; first abdominal segment above, and the second to three-fifths of its length, reddish yellow; scutellum black. (At Trent the Italian Bee only is known. Near Botzen the German form begins to occur.)
9. DALMATIA (Ehrenberg, Stein).—4 specimens.
 - a. (3 sp.) from Spalato, 1858. Unicolorous northern Bee.
 - b. (1 sp.) of earlier date. Somewhat smaller and more slender than the German, more densely clothed with yellow hair;

* When not otherwise stated, the following descriptions are all of workers.

- first abdominal segment above, second to three-fifths of its length, and middle of scutellum reddish yellow.
10. MEHADIA in the Banat (Stein).—1 specimen.
Exactly like *b.* from Dalmatia.
11. RUSSIA (Pallas).—1 specimen.
Unicolorous northern Bee; sent by Pallas as *Apis cerifera*, Pall.
12. GREECE (Kriiper).—1 specimen.
Scarcely smaller than the northern Bee; second abdominal segment on each side at the base with a small reddish-yellow point.
13. CRIMEA (Nordmann).—16 specimens.
- a. (5 sp.) Unicolorous northern Bee.
 - b. (5 sp.) Similar, but the second abdominal segment with a small yellow point on each side at the base.
 - c. (1 sp.) The yellow point extended into a transverse spot.
 - d. (4 sp.) Instead of the transverse spots, a reddish-yellow band on the second segment, occupying progressively one-fifth, one-third, and one-half of its length.
 - e. (1 sp.) First abdominal segment and second to two-thirds of its length reddish yellow; scutellum reddish in the middle.
14. RHODES (Loew).—8 specimens.
- a. (1 sp.) With a reddish-yellow transverse spot on each side the base of the second segment; scutellum all black.
 - b. (1 sp.) Similar, but scutellum with a red apex.
 - c. (1 sp.) With a reddish-yellow transverse band occupying one-third the length of the second segment; scutellum with the apex red.
 - d. (5 sp.) Reddish-yellow band of second segment one-third to two-thirds of its length; first segment above and the whole or greater part of the scutellum yellowish red. All the specimens of the same size as the northern Bee, but more densely clothed with more intensely yellow hair.
15. EPHEBUS (Loew).—1 specimen.
Like the northern Bee, but more densely clothed with paler greyish-yellow hair.
16. BRUSSA (Thirk).—2 specimens.
- a. Size of the northern Bee, and similar in colour and clothing, but with a yellow point on each side of the second abdominal segment.
 - b. A little smaller than the northern Bee; first segment and second to two-thirds of its length, and the entire scutellum reddish yellow.
17. CAUCASUS (Pallas).—1 specimen.
Colouring as in *b.* from Brussa; size a little larger. (This specimen sent by Pallas as his *Apis remipes*).

18. EGYPT (Ehrenberg).—5 specimens.
Smaller and more slender than the northern Bee; both the hairy and downy clothing whitish, sometimes yellowish on the thorax; smoky brown only on each side of the vertex, whitish in the middle. Apices of the mandibles and frontal tubercles rusty red; first and second abdominal segments reddish yellow to the margin, third segment to half its length; scutellum almost entirely reddish yellow. (*Apis fasciata*, Lat.)
19. ARABIA FELIX (Ehrenberg).—1 specimen.
Agreeing with the Egyptian Bee.
20. SYRIA (Ehrenberg).—5 specimens.
Almost identical with the Egyptian Bee, but the thorax clad all over with yellowish hair, and the yellow band of the second abdominal segment varying between one-half and four-fifths of its length; size a little larger.
21. HIMALAYA (Hoffmeister).—1 specimen.
Size and colouring of the Syrian specimens, but the scutellum brownish to the yellow apex.
22. CHINA (Colomb).—1 specimen.
Size and colouring of the Egyptian Bee, but the vertex entirely clothed with fuliginous hair. (*A. cerana*, Fabr.)
23. SENEGAMBIA (Mion).—1 specimen.
Size and colouring of the Egyptian Bee, but the hair more of a greyish yellow. (*A. Adansonii*, Lat.)
24. GUINEA (Isert).—2 specimens.
a. Size intermediate between that of the Egyptian and northern Bees; apices of the mandibles and frontal tubercles rusty red; scutellum nearly all yellowish brown; first abdominal segment, and second as far as the half, yellowish red above. (*Apis nigritarum*, Lep.)
b. Same size; colour uniform light brown.
25. CAPE OF GOOD HOPE (Krebs).—10 specimens. All somewhat smaller than the northern Bee.
a. (4 sp.) Blackish brown, with only a narrow basal margin of reddish yellow on the second segment; scutellum black.
b. (1 sp.) Similar, but the yellow border of the second segment dilated on each side into a spot.
c. (2 sp.) Similar, but the second segment reddish yellow for almost half its length; scutellum in one specimen reddish brown. (*A. caffra*, Lep.)
d. (2 sp.) First segment to the margin, second to two-thirds, and third to almost half its length yellowish red; scutellum with the whole middle reddish.
e. (1 sp.) Similar, but the whole scutellum reddish yellow.

26. PORT NATAL (Wahlberg).—1 specimen.
Exactly like specimen *e.* from the Cape.
27. MOZAMBIQUE (Peters).—4 specimens.
Exactly like specimen *e.* from the Cape.
28. MAURITIUS (Deyrolle).—1 specimen.
Similar in size to the Cape specimens; colour entirely dark, almost black upon the abdomen; hair scanty.
29. PENNSYLVANIA (Zimmermann, Sommer).—4 workers, 1 drone.
Worker a little more slender than the northern Bee, like this in colour and clothing, with only a narrow reddish-yellow basal border on the second abdominal segment.
30. MEXICO (Deppe).—4 workers, 1 drone.
Exactly like the northern Bee.
31. CUBA (Riehl).—1 worker, 1 drone. As Mexico.
32. PORTO RICO (Moritz).—1 worker. As Mexico.

Of the colour-varieties here described, the most convincing proof of the inconstancy of the colour, and consequently of a probable intermixture of different varieties, is furnished by Nos. 13, 14, and 25, which at the same time prove that not the least dependence can be placed upon the coloration of the scutellum. The variability of the coloration under the different numbers gives transitions from one form to another; and thus it becomes impossible to define clearly limited varieties. Latreille and Lepelletier made 8 species out of the Honey-Bee; with equal justice we might now, from the existing materials, make 20–30. But by referring those specimens which evidently form transitions from one principal race to another to the race with which they have most in common, we may get six principal varieties, with the following geographical distribution:—

1. The unicolorous, dark northern Bee (including the most nearly allied lighter varieties) occurs in Northern Europe, where until very lately it was the only form; in the south of France, Portugal, the south of Spain, and Algiers; likewise in some districts of Italy, in Dalmatia, Greece, the Crimea, and on the islands and coast of Asia Minor; lastly, in Guinea, at the Cape of Good Hope (probably introduced), and in a great part of North America (certainly introduced).
2. The Italian Bee (with a black scutellum) occurs almost exclusively in different districts of Italy, especially in the northern parts, including the Tyrol and the Valteline. Introduced lately into Northern Europe.
3. A variety differing from the Italian Bee in its yellow scutellum occurs in the south of France, in Sicily, Dalmatia,

- the Banat, the Crimea, the islands and continent of Asia Minor, and on the Caucasus.
4. The Egyptian Bee is diffused from Egypt, through Syria and Arabia, and passes imperceptibly, through a lighter variety occurring on the Himalaya and in China, into
 5. The specific African Bee, which extends over the whole of Africa, from Abyssinia and Senegambia to the Cape.
 6. The black Madagascar Bee is limited to Madagascar and the Mauritius.
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In the concluding portion of his paper the author treats of the exotic Honey-Bees of the Old World distinct from *Apis mellifica*. He confines his attention to the Old-World forms because, although America possesses numerous species of honey-gathering Bees, these belong to genera (*Melipona* and *Trigona*) which differ greatly from the Hive-Bee both in characters and in value; so that wherever the European Bee has been introduced, they have lost their importance as producers of wax and honey. Some of the East-Indian species, on the contrary, appear to be of great value; and their introduction into other suitable localities might be found useful. These Bees inhabiting the continent and islands of India are also in considerable confusion as regards their specific identity, too much stress having been laid upon variations of colour in them, as in the varieties of the European Bee: instead of thirteen species, described by Fabricius, Latreille, Klug, Guérin, and Smith, the author considers that there are only three, all-belonging to the genus *Apis*, but forming the following two groups:—

GROUP I. Vertex distinctly narrowèd by the large compound eyes, so that the posterior ocelli are more distant from each other than from the eyes. Abdomen remarkably elongated, somewhat flattened above; metatarsus of the hind legs with thirteen transverse rows of bristles on the inside. In the anterior wings the recurrent nervure issues very near the apex in the third cubital cell. Here belongs *Apis dorsata*, Fab. (*nigripennis*, Lat.), with its two colour varieties, *Apis zonata*, Guér., and *A. zonata*, Smith.

GROUP II. Vertex not perceptibly narrowed, so that the hinder ocelli are not more distant from each other than from the compound eyes. Abdomen oval, convex above; metatarsus of the hind legs with nine transverse rows of bristles on the inside. Recurrent nervure issuing far from the apex in the third cubital cell. Here belong, with *Apis mellifica*, the two smaller East-Indian species,—1. *Apis indica*, Fab. (*socialis*, Lat.), with its varieties *A. Peronii*, Lat., *A. Perrottetii*, Guér., and *A. nigro-*

cincta, Smith; 2. *Apis florea*, Fab. (*indica*, Lat.), with its drone, *A. lobata*, Smith.

The first of the three East-Indian species, *Apis dorsata*, Fab., is remarkable for its size, as dry specimens measure $7\frac{1}{2}$ to $8\frac{1}{2}$ lines in length. Freshly developed specimens, sent from Luzon by Jagor, are of a light pitchy-brown colour all over the body and legs, and their clothing of hair everywhere brownish grey; the wings are hyaline, with a distinctly greyish-brown tint. When completely coloured, the head and antennæ are shining pitchy black; vertex clothed with long, erect, deep blackish-brown hair; the border of the upper lip and mandibles has a reddish-brown tint; the two frontal tubercles and the apices of the scapes of the antennæ pale rusty red. Ocelli remarkably large. Thorax above, as far as the scutellum and sides of the breast, with blackish-brown hairs; scutellum and metanotum with tawny-yellow hairs. Anterior wings dark brown along the outer margin, paler brown over the whole disk. Legs pitchy black, fringed with hair of the same colour; the brush on the inside of the posterior tarsi cinnamon-red. The colouring of the abdomen marks three varieties:—

- a. Abdomen above clothed with densely adpressed hairs, of a uniform yellow colour, or only a little more dusky, or rather grey, at the apex; beneath pitchy brown, rusty yellow towards the base. Indigenous in Java. Described by Fabricius (Ent. Syst. ii. p. 323. 64), in 1793, as *Apis dorsata*; afterwards (1804) by Latreille (Ann. du Mus. v. p. 170. 4) as *A. nigripennis*).
- b. Abdomen with only the back of the first two segments yellow, and the rest blackish brown or nearly black, or with the middle of the third segment also yellowish, and the base of this and the following segment adorned with a transverse band sprinkled with white. Upon this variety, figured by Latreille (*loc. cit.* pl. 13. fig. 7), Klug (Mag. Gesellsch. naturf. Freunde, i. p. 264) founded his *A. bicolor*, and Guérin (Bélangier's Voyage, Insectes, p. 504) his *A. zonata*. It occurs with the preceding in Java, and also in Ceylon (Nietner).
- c. Abdomen yellow only on the anterior part of the first segment; the remainder is deep black, with white-besprinkled basal bands on the third, fourth, and fifth segments; these also pass to the lower surface. Examples of this variety from Celebes are the largest, and others from Luzon the smallest of all. Smith described the former under the name of *A. zonata* (Proc. Linn. Soc. iii. p. 8).

This is evidently the species mentioned by Knox, in his work

on Ceylon, under the name of *Bamburos*. He says, "Their honey is as clear as water; they place their nests on the highest branches of trees, and take no trouble to conceal them. At a certain season of the year, whole villages go out to collect their honey." The queen and drone of this species are still unknown.

The second species, *A. indica*, Fab., most resembles our European Bee in form and colouring, but is much smaller, dry specimens measuring only $4\frac{1}{2}$ lines. This species is subject to great variation of colour in most parts of the body, and even in the wings. Adopting the coloration of the abdomen as a distinction, the following three chief varieties may be indicated:—

- a. Abdomen either light rusty red as far as the last two pitchy-brown segments, or the third and fourth segments from the apex likewise show a slight brownish tinge at the base. The scutellum is always pale reddish yellow, and the hair of the head and thorax greyish yellow. The clypeus and scape are seldom entirely pitchy brown; the former is usually reddish in its lower half, and the latter in the middle. This pale variety appears to be chiefly indigenous to the continent of India; it was first described by Fabricius (Ent. Syst. Suppl. p. 274. 59) as *Apis Indica*; then by Latreille (*loc. cit.* p. 172. 7) as *A. socialis*; by Lepelletier (Hyménopt. i. pp. 404, 405) as *A. socialis* and *dorsata*; and lastly by Guérin (Iconogr. du Règne Anim. p. 461) as *A. Delesserti*.
- b. Abdomen with the first two segments and the base of the third reddish yellow, the remainder blackish brown, with bands of light yellow hair. Scutellum generally pale, sometimes blackish; the hair of the thorax brownish yellow, that of the vertex fuliginous. Clypeus generally all black, sometimes reddish at the apex; scape dark. Principally in Java; also at Poona (Hope). Latreille (*loc. cit.* p. 173. 8) described this form as *A. Peronii*.
- c. Abdomen with only the anterior part of the first and the basal half of the second segment reddish yellow, the remainder blackish brown. Clothing as in *b*; the scutellum partly blackish, partly reddish yellow. With a black clypeus and scape this variety is indigenous at Pondicherry and in Ceylon, and has been described by Guérin (Iconog. p. 460, f.) as *A. Perrottetii*; with a red clypeus and paler scape it is *A. nigro-cincta*, Smith (Proc. Linn. Soc. v. p. 93), from Macassar. The latter has lately been received from Luzon, where it is mixed in almost equal proportions with the other variety.

Knox, in his description of Ceylon, says, "The first kind of Honey-Bees are the *Memasses*, which are exactly like our Bees

which we have in England; they build in hollow trees, into which the people blow, and from which they take honey and wax, without any dread of being stung." Here he seems to refer to the *Apis indica*, which he erroneously identifies with the European Bee.

The third East-Indian species, incorrectly regarded by Latreille as *Apis indica*, Fab., but which, from a comparison with the original specimens of Fabricius, is the *Anthophora florea* of that entomologist (Ent. Syst. ii. p. 341. 118), and must therefore be called *Apis florea*, Fab., is the smallest of all known species, the workers measuring scarcely more than $3\frac{1}{2}$ lines. The author has workers from Tranquebar, Java, and Poona, and workers and drones from Ceylon. This species seems to vary less than the others, although young workers may be recognized by the light colour of the abdomen and the rusty-red tint of the legs, scapes, and clypeus. The coloration, in fully developed specimens, is as follows:—Head, including upper lip and antennæ, black, with only the frontal tubercles rusty red; thorax and legs likewise black, and, like the head, clothed with white hairs. Abdomen generally with the first two segments tile-red, the rest black, and with snow-white hair at the base; rarely the third segment shows some red, and still more rarely the second some black. The wings are hyaline, with rusty-yellow veins. The drones which are believed to belong to these workers (*Apis lobata*, Smith, Catal. Apidæ, p. 416. 10) are considerably larger than the workers, namely, $4\frac{3}{4}$ lines long. They have the body black; thorax and two basal segments of the abdomen clothed with yellowish-grey hairs; the apex of the abdomen clothed with black hair; the third and fourth segments naked, shining. Structural characters distinguishing these drones from those of the European species are as follow:—

1. The head is more convex, and the eyes therefore larger;
2. The antennæ are very short, the flagellum scarcely double the length of the scape;
3. The metatarsus of the posterior legs is very peculiarly forked; the outer branch of this fork is the thicker, inflated on the outside, hairy within, and bears at its apex the following tarsal joints; the inner one has somewhat the form and position of a thumb, and is only two-thirds the length of the outer. A comb unquestionably belonging to this species has been described and figured by Latreille (Annales du Mus. iv. p. 386, pl. 69, and Recueil d'Obs. de Zool. p. 302, pl. 21). In its substance it agrees precisely with that of *Apis mellifica*; its cells are hexagonal, applied to each other back to back, and with their bases alternating and interlocking. The difference in the size of the cells is very great: $33\frac{2}{3}$ cells of *A. florea* occupy the same space as $18\frac{1}{2}$ of *A. mellifica*. The drone-cells found with

worker-cells in the comb are much larger, much thicker in the walls, and nearly cylindrical internally.

In conclusion, the author enters upon the question of the acclimatization of new forms of Bees. For Europe, he thinks the most valuable form would be the Egyptian, partly on account of their beauty, and partly because of their unwillingness to use their stings, which appears to be common to all African Bees, and is also one of the recommendations of the Italian Bee. The Syrian Bee agrees so closely with the Egyptian that it may prove equally valuable; and next to these in value, according to the author, are the Bees of the coasts of Asia Minor. Of the East-Indian Bees, the introduction of the fine *Apis dorsata* would probably be most welcome to the European bee-keepers; but there are doubts whether it would bear a northern climate; and before it can be introduced into Europe, it must be domesticated in some of its native haunts. The author suggests that some of the planters of Ceylon might succeed in effecting this preliminary object.

XXXVIII.—On *Microstelma* and *Onoba*, two Forms of Rissoid *Gasteropods*; with Notices of new Species of the latter from Japan. By ARTHUR ADAMS, F.L.S. &c.

IN addition to the new species of Rissoid genera which I have recently published in the 'Annals,' I beg to bring before the notice of your readers an entirely new form and several new species of *Onoba*, reserving my observations on the genus *Rissoina* for a future communication, which will complete my examination of the family Rissoidæ inhabiting the Seas of Japan.

Genus MICROSTELMA, A. Adams.

Testa turrilo-ovata, rimata; spira conica; anfractibus longitudinaliter plicatis. Apertura oblonga, antice producta, subcanaliculata; labio incrassato, rectiusculo; labro simplici.

This very pretty form, which most nearly resembles the genus *Rissoina*, I obtained in the Gotto Islands, by a cast of the dredge, in forty-eight fathoms water. The shell only was obtained; so that our account of the genus, like that of many others proposed, is necessarily very imperfect. Such must frequently be the case with regard to very deep-water acquisitions from far-off and little-known localities; and such, of course, is always the case with fossil or extinct forms.

In the sand from the same locality I fortunately obtained living examples of the genus *Verticordia*, hitherto only known